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6. AUTHOR(S) James R. Thompson		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Dept. of Statistics, Rice University, 6100 S. Main Street, Houston, TX 77005-1892		8. PERFORMING ORGANIZATION REPORT NUMBER
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13. ABSTRACT (Maximum 200 words)

The supported graduate student, John Dobelman has begun extensive work on his disseration to find stochastic models to explain the mechanisms whereby electricity prices spike.

Three books and six papers were authored or co-authored by Thompson during this grant period. The common thread is the development of models supported by intensive computer simulation to help explain and understand real world processes. Among these investigations are included models for statistical process control in situations new to SPC. Almost all SPC treatises deal with situations in which the paradigm is of mature usage. Thompson shows how difficult such implementations are to achieve in practice and gives means for jumpstarting SPC in such systems as the International Space Station. The first world AIDS epidemic has received substantial attention by Thompson. Most recently he has given a model based argument that there is no standalone AIDS epidemic in Europe: it only exists by contacts with American infectives. In stochastic process based economic modeling, Thompson and his co-authors have shown how effective simulation models of relative simplicity and parametric parsimony may be achieved by aggregation from the micro to the macro. The *simugram* is Thompson's discovery that we can forecast the future multivariate stochastic process of even a large portfolio by the use of simulation. The risk neutral formula of Black-Scholes-Merton is shown to be seriously deficient as a practical tool. Similarly, the artificiality of the portfolio paradigm of Markowitz is replaced by other, conceptually simple, but requiring extensive computer simulation, techniques. Work is done which shows how data analysis in high dimensions needs to be carried out with techniques very different from those used in low dimensions.

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Three books were authored or co-authored by Thompson during this grant period.

Simulation: A Modeler's Approach, New York: John Wiley & Sons, 1999, 297 pages.

Statistical Process Control:The Deming Paradigm and Beyond (with Jacek Koronacki), Boca Raton:Chapman&Hall, 2001, 431 pages.

Models for Investors in Real World Markets} (with Edward E. Williams and M. Chapman Findlay), New York: John Wiley & Sons 2002, 372 pages.

Six papers were authored or co-authored by Thompson during this grant period.

"A Post Keynesian analysis of the Black-Scholes option pricing model," (with Edward E. Williams) (1999) in { *The Journal of Post Keynesian Economics*}, Winter, pp. 251-267.

"Understanding the AIDS Epidemic: A Modeler's Odyssey" (1999), in *Applied Mathematical Modeling,* D. Shier and T. Wallenius, eds., New York: CRC Press pp. 41-69.

"Is the United States Country Zero for the First-World AIDS Epidemic?" (2000) *The Journal of Theoretical Biology*, pp. 621-628.

"Venture capital funded internet companies' liquidity in post lockup valuation," (with P. Cohen and E. Williams) (2000) in *Frontiers of Entrepreneurship Research* 2000.

"The Age of Tukey."(2001) in *Technometrics*, v.43, no.3, pp 256-265.

"Why we all held our breath when the market reopened," (2003). with Findlay, M. C. and Williams, E.E., *Journal of Portfolio Management,* Summer, forthcoming.

Thompson and Koronacki's *Statistical Process Control: the Deming Paradigm and Beyond* (2001) is a revised and expanded (by 25%) new edition of *Statistical Process Control for Quality Improvement (1992)* which presented the first extensive development of algorithms---parametric and nonparametric--- for the multivariate data stream situation.. This new book, published in December of 2001 by CRC/Chapman & Hall, shows how dramatically different is SPC from earlier standard quality control procedures, e.g., the Military Standard-105D. The MLT-STD-105D was introduced during World War II and is driven by slogan rather than reality. (Thompson has earlier argued that it probably was introduced from the USSR, since it has all the characterisitics of the highly triumph-of-hope-over-experience underpinings which characterized all Soviet production, particularly military production.) Unfortunately the MLT-STD-105 forms the basis for most quality control in the United States today. For every quality professional using the Deming approach, there are probably ten still enforcing the MLT-STD-105. The new book is an attempt to demonstrate that Deming developed a highly effective method for step-wise optimization of an ill posed control problem. Deming never deigned to explain the theory behind his procedures, presenting them with the same didactic flavor as that employed by the MLT-STD-105 professionals. Thompson and Koronacki infer the model behind Deming's work and extend its use, particularly to data based procedures using data of high dimensionality. From a practical standpoint, this book deals with the generally untreated situations where one wishes to begin SPC in new scenarios where SPC has not been used before. One example of this, is a Bayesian-Pareto strategy for instituting SPC in the management of the International Space Station.

Thompson's *Simulation: A Modeler's Approach* (1999) published by John Wiley & Sons is a nonstandard approach to computer simulation. Rather than presenting simulation techniques as stand-alones, Thompson develops simulation as a powerful adjunct to the creation, implementation and validation of models. The computer is not simply a fast calculator, but a device for changing, fundamentally, the modeling process. Some of the topics included are resampling in the analysis of the Darwin's zea-mays data set, simulation based techniques for parameter estimation in stochastic process models, simulation based Bayesian data analysis, empirical likelihood, optimization in a noisy world, exploration and estimation in high dimensions with an examination of the Fisher-Anderson iris data. In general, for high dimensional data, Thompson advocates finding local centers of high concentration and using local multivariate Gaussian models around these centers.

Thompson's "The Age of Tukey" published in the August, 2001, issue of *Technometrics* was an attempt to examine the influence of the late John W. Tukey on statistics. The paper was also the basis for the keynote address at the October, 2001, Tukey Conference at the University of Colorado (Denver). Thompson's conclusions are that Tukey moved statistics out of the Aristotelian methodology of Pearson and Fisher into a more empirical posture highly suspicious of objective reality. Gestaltic argumentation has become a replacement, in the minds of Tukey enthusiasts, for modeling. The substantially positive feedback is that Thompson, Aristotelian and modeler though he be, presented John Tukey in a sympathetic and very positive

light. The Tukey Revolution has proceeded so gradually that, prior to the publication of the article, many had not understood that statistics had turned down a new street with new perils and opportunities.

"Is the United States Country Zero for the First-World AIDS Epidemic?" (2000) in *The Journal of Theoretical Biology*, pp. 621-628, gives a data based argument to the effect that there is no standalone AIDS epidemic in Western Europe. Rather, it is contacts with infectives from the standalone USA AIDS epidemic which allows an apparent epidemic to exist in Europe. The number of AIDS deaths in the United States is already in excess of the total of American fatalities in World War II. It has now passed the death total from the previously most lethal epidemic in the United States, namely the Spanish Influenza epidemic which occurred at the end of World War I. In "Understanding the AIDS Epidemic: A Modeler's Odyssey" (1999), in *Applied Mathematical Modeling,* D. Shier and T. Wallenius, eds., New York: CRC Press pp. 41-69, Thompson gives a summary of his nearly 20 years of work in AIDS modeling. It details the discoveries and frustrations of Thompson since his model based analysis in 1984 demonstrated that the US epidemic had crossed from endemic to epidemic due to activities made possible by the presence of the gay bathhouses. These establishments still do a thriving business in the United States, though they were long ago defacilitated in Western Europe. Thompson opines that the failure of US public health to deal with the underlying causes of AIDS was due to a triumph of political correctness over facts and logic. The US AIDS epidemic is clearly the greatest public health debacle in the history of the United States.

Thompson, Williams, and Findlay have recently (November 15, 2002) published *Models for Investors in Real World Markets,* with John Wiley & Sons. This book questions some fundamental models utilized in modern economics and finance. These models, chosen for simplicity rather than realism, have led to such debacles as the collapse of Enron and that of the LTCM-LP. Moreover, these models are, in practice, deterministic rather than stochastic. We develop the *simugram* which enables one to input model assumptions into realistic models of some aggregate complexity and observe the time evolving stochastic process by obtaining (by repeated simulations) predicted distribution slices in time. This *risk profile analysis* reveals that market strategies which led to disaster could have been anticipated if one looked at the distribution of posible results as opposed to looking simply at their expectations. . The risk neutral formula of Black-Scholes-Merton is shown to be seriously deficient as a practical tool. Similarly, the artificiality of the portfolio paradigm of Markowitz is replaced by other, conceptually simple, but requiring extensive computer simulation, techniques.

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